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RESEARCH ARTICLE

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SEISMIC VIBRATION CONTROL OF RC BUILDINGS USING DAMPER-INTEGRATED MODIFIED FRAME HEAR WALL SYSTEM

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ABSTRACT

Earthquake-induced vibrations cause severe damage to reinforced concrete buildings, especially in high seismic zones. Conventional frame structures often fail to provide adequate lateral stiffness and energy dissipation capacity. This study investigates the seismic performance of a modified frameshear wall system integrated with viscous dampers for effective vibration control. Three building models, namely bare frame, frame with shear wall, and damper-integrated modified frame? shear wall system, were developed and analyzed using nonlinear time history analysis. Real earthquake ground motion records were applied to evaluate the structural response. The results show that the modified system significantly reduces storey displacement and inter-storey drift while improving energy dissipation capacity. The proposed system demonstrates improved seismic safety and can be effectively implemented in earthquake-prone regions.

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INTRODUCTION

When an earthquake happens building experience strong shaking, which harmful for vibrations and movement. This reduced using new ideas like Smart Sensors, MR Damper,and Viscous Dampers. for this system Reinforced Concrete (RC) frames and shear wall are combined and integrated with dampers. Dampers absorb and dissipate the energy generated during an earthquake which help reduce vibration.Earthquakes generate strong lateral forces that cause excessive vibration and displacement in buildings. using Modified frame shear wall its system develophybrid solution that improves seismic performance by combining stiffness, ductility, and vibration control mechanisms using smart sensor and AIthey provide real time monitoring. modular shear wall changes after earthquake easily.

Research Gap: Research has been conducted on seismic performance improvement of RC buildings using by conventional research shear wall systems, Smart sensor, moment-resisting frames, and has externally installed damping devices. A lot of research has been done on how to make RC building during earthquake using standard method like shear wall, of fixed frame and dampers. most existing studies look at either the frame – damper interaction or the shear wall performance separately they do not address the complex, combined behaviour of following element like frame, wall and Damper combined application of dampers within modified frameshear wall systems remains limited and insufficiently. Most focus on complex coupled behaviour frame–wall–damper systems under dynamic earthquake loading.

Objective

Primary Objective: To evaluate the seismic vibration control performance of a damper-integrated modified frameshear wall system using nonlinear time history analysis.

Secondary Objectives:

- Normal frame building vs frameshear wall vs modified system
- Story drift, displacement, base shear, acceleration
- Energy dissipation improvement
- Damper Coefficient and stiffness

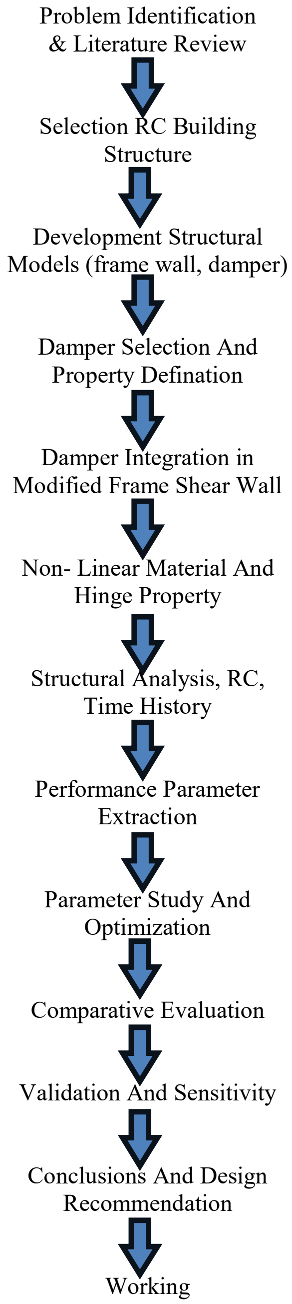
Model	Description
Model 1	Bare RC Frame (reference model)
Model 2	Frame + Shear Wall
Model 3	Frame + Shear Wall + Viscous Dampers (MODIFIED MODEL)

Building Configuration

- G+10 storey building
- Storey height: 3 m
- Plan: 20 m × 20 m
- Column: 500 × 500 mm
- Beam: 300 × 450 mm
- Shear wall thickness: 200 mm
- Concrete: M30
- Steel: Fe500
- Seismic Zone: High (Zone IV / V equivalent)

METHODOLOGY

Designed to evaluate the seismic performance of a damper-integrated modified frameshear wall system through analytical customizing, nonlinear dynamic analysis, and comparative performance assessment.



The damper-integrated modified frameshear wall system operates based on performance-based seismic design principles, where structural behaviour is controlled to meet predefined performance objectives such as Immediate Occupancy, Life Safety, and Collapse Prevention. The system is designed not only to resist seismic forces but also to regulate damage distribution and vibration response under different earthquake intensity levels.This system works by controlling building movement and damage during earthquakes according to performance-based design objectives. When a small earthquake occurs, the structure mainly behaves elastically, meaning there is little or no damage, and the building remains fully functional. During moderate to strong earthquakes, the dampers become active and start absorbing seismic energy, which reduces excessive vibrations and limits inter-story drift. At the same time, the shear walls provide stiffness to control overall building sway, while the frame system allows safe deformation without sudden failure. In severe earthquake conditions, the dampers dissipate a large portion of the input energy, helping to prevent excessive damage to critical structural members and reducing the risk of collapse. This controlled behaviour ensures that damage is concentrated in replaceable or less critical components rather than in main load-carrying elements. As a result, the system improves safety, minimizes permanent deformation, and allows faster post-earthquake recovery, making RC buildings more resilient and serviceable after seismic events.

Advantages

- **Reduces Building Vibration:** The system uses “damper, that absorb the earthquakeenergy, making the building shake less and feel more stable during an earthquake.
- **Controls Structural Damage:** Damage is limited to specific, responsible part the damper inside the main structure which help for protect the building core.
- **Improves Safety of Occupants:** Less movement and controlled damage mean people inside the building are much safer during seismic events.
- **Improves Post- Earthquake Usability:** Because permanent deformation is reduced, the building can be reused quickly after an earthquake with minimal repairs.
- **Cost Effective in Long Term:** Although dampers increase initial cost, they reduce repair and reconstruction expenses after earthquakes.

Applications

- **High- Rise RC Buildings:** It is used in multi-storey residential and commercial buildings for control excessive lateral displacement and vibration during earthquakes.
- **Emergency Facilities:** Applied in hospitals, fire stations, temples, industries, colleges, bridges, museums and disaster-response buildings to ensure operational safety during and after earthquakes.
- **Retrofitting of Existing RC Building:** Dampers can be added to existing frameshear wall systems to improve seismic resistance without major demolition.

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Future Scope: The proposed Seismic Vibration Control of RC Buildings Using Damper-Integrated Modified FrameShear Wall

Systemcan be further enhanced and expanded in several way advanced sensors can be integrated to improve accuracy and damper-integrated modified frameshear wall systems is very promising in improving the seismic safety of RC buildings. With advancements in smart and semi-active dampers, such systems can provide better energy dissipation and adaptive response during earthquakes. Further research can focus on performance-based seismic design and optimization of damper placement to achieve maximum efficiency at minimum cost. This system also has great potential in the retrofitting of existing and old RC structures, especially in high seismic zones. Additionally, advanced numerical customizing, experimental studies, and integration with real-time structural health monitoring can further enhance the reliability and practical application of this vibration control technique.

CONCLUSION

The Earthquake Vibration BasedUsing Damper-Integrated Modified FrameShear Wall Systemprovides and efficient solution for improving building safety and public management. The damper-integrated modified frameshear wall system is an effective and reliable solution for controlling seismic vibrations in reinforced concrete buildings. By combining the stiffness of shear walls, the flexibility of moment-resisting frames, and the energy dissipation capacity of dampers, the system significantly reduces structural damage, inter-storey drift, and overall seismic response. This approach enhances safety, durability, and performance of buildings in earthquake-prone areas and is suitable for both new construction and retrofitting of existing structures. Hence, the use of damper-integrated frameshear wall systems plays a vital role in achieving improved seismic resistance and sustainable structural design.

REFERANCES

Comparison on Seismic Resilience of Hybrid, Isolation, and Damping Control RC Frame-Shear Wall Buildings – Discusses various control strategies including damping in frame-shear wall systems. https://www.sciencedirect.com/science/article/pii/S2352012423015692

Earthquake Vibration Control using Modified Framed Shear Wall – Research article showing vibration control techniques for framed shear wall structures. https://ijrt.org/j/article/view/188

Influence of Damping Systems on Building Structures Subject to Seismic Effects – A technical paper on how different damping mechanisms affect seismic response. https://www.sciencedirect.com/science/article/pii/S0141029604002470

Seismic Mitigation Efficiency Study of the Coupling Beam Damper in Shear Wall Structures – Examines how dampers in shear walls reduce drift and base shear. https://ojs.cvut.cz/ojs/index.php/cej/article/view/7161

Seismic Response of RC Frame-Shear Wall Structure with Metal Rubber-Based Damper – Study on using dampers in coupling beams for seismic energy dissipation. https://www.iieta.org/journals/acsm/paper/10.18280/acsm.440503

Smart Seismic Control System for High-Rise Buildings Using Large-Stroke Viscous Dampers – Example of advanced damper integration for vibration control. https://www.frontiersin.org/articles/10.3389/fbuil.2020.00029/full

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